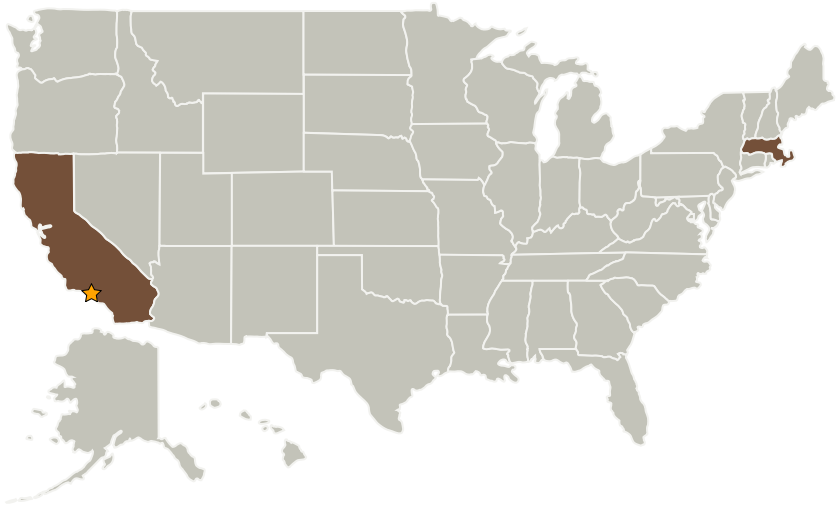
Precise Thrust Actuation by a Micro RF Ion Engine, Phase I

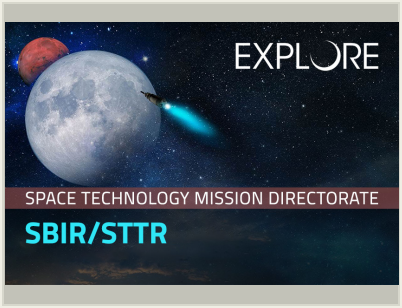
Completed Technology Project (2009 - 2009)

Project Introduction

Busek proposes to develop a radio-frequency discharge, gridded micro ion engine that produces μN level of thrust precisely adjustable over a wide dynamic thrust range. Rf discharge was chosen to eliminate the life-limiting internal cathode of a dc discharge ion engine. Thrust actuation on the order of 0.03μN resolution is proposed with a closed-loop control system. This controlling scheme can be achieved by varying only one parameter: the rf power with a feedback from the beam current. Uniquely, the rf ion engine can also produce enough thrust for coarse constellation corrections or reconfigurations. Argon will be the base-lined propellant to ease concerns of propellant condensing on optics or other cryogenic surfaces. This feature can be critical for close formation flying as micro-thrusters such as field emission electric propulsion (FEEP) and colloids could potentially coat neighboring spacecraft. The proposed rf ion engine, combined with Busek's space-qualified carbon nanotube field emission cathode (developed for the ST7 DRS mission) as a neutralizer, will create a new opportunity in precise thrust actuation. Further implementation of a simple propellant feed system and power electronics will create a compact, low power, high performance spacecraft propulsion system.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Busek Company, Inc.	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Natick, Massachusetts

Primary U.S. Work Locations	
California	Massachusetts

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic